SHEEP RESEARCH

U. S. SHEEP EXPERIMENT STATION
and the
WESTERN SHEEP BREEDING LABORATORY

DUBOIS, IDAHO

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
ANIMAL SCIENCE RESEARCH DIVISION
AND COOPERATING STATES

TABLE OF CONTENTS

Introduction 1

Breeding Research 2

Physiology of Reproduction 6

Artificial Rearing of Lambs 10

Nutrition and Management 13

Range Research 16

Wool Research 18

Animal Disease 20

INTRODUCTION

THE U. S. SHEEP EXPERIMENT STATION

DUBOIS, IDAHO

The U. S. Sheep Experiment Station was established in 1916 by the U. S. Department of Agriculture for the purpose of conducting range sheep investigations. The objectives are to increase through research, production and quality of lamb meat and wool.

The Station is administered by the Sheep and Fur Animal Research Branch of the Animal Husbandry Research Division, Agricultural Research Service, U. S. Department of Agriculture.

The research programs are conducted in cooperation with the Idaho Agricultural Experiment Station. The Western Sheep Breeding Laboratory is composed of Agricultural Experiment Station Cooperators from the eleven western states and Texas.

The Intermountain Forest and Range Experiment Station of the U. S. Forest Service conducts range management research in cooperation with the Station.

The 5,800 Rambouillet, Targhee and Columbia sheep involved in the research programs graze on 48,000 acres of native range and an additional 23,000 acres of Targhee National Forest range. The winter feedlot is located west of Mud Lake, Idaho on State Highway 28.

This brochure is presented to give livestock producers a brief picture of the extent of the present research program at the U. S. Sheep Experiment Station.

LOCATION

THE U. S. SHEEP EXPERIMENT STATION IS LOCATED 6 MILES NORTH OF DUBOIS, IDAHO ON INTERSTATE HIGHWAY 15.

BREEDING RESEARCH

A process which is absolutely essential both to learning how to most efficiently improve sheep genetically and to actually making the genetic improvement is keeping detailed, accurate records relating to every trait one desires to improve. In addition, one should keep records relating to other traits of economic importance simply to alert oneself to any changes which may also be occurring in these traits as a result of selection for others. For the records to be useful in a breeding program, they must be associated with individual animals, which requires unique individual animal identification. The picture on the right illustrates recording birth information on IBM cards in the lambing shed and uniquely identifying each lamb with duplicate eartag numbers at birth.

Genetic Change Resulting from Selection

Genetic changes are permanent changes in the biological characteristics of a breeding flock, which occur as the result of selection of particular animals to become parents. Too often, temporary changes resulting from selection are mistakenly thought to be permanent, i.e., genetic. Temporary, instead of permanent, improvements arise because of confusion in selecting genetically superior animals for breeding. An important objective of the Station is to learn how to identify such animals and to measure the genetic changes resulting from selecting and breeding them. We have learned that many nongenetic factors, such as age of dam, type of birth and rearing, band in which grazed, year of record, age of animal, etc., cause us to make errors in selecting genetically superior animals, unless we account for their effects. We have found that the rate of genetic change actually realized is usually far less than many people would like to think, but still large enough to be distinctly encouraging for some traits. For example, we have genetically improved the overall merit of a group selected on the basis of an index of several traits at a rate of 2.1% of the total range in indexes per year. Face cover was improved 1.2% of the range, horn score 3.3%, grease fleece weight 0.11 lb. and pounds of lamb weaned 0.42 lb. Weaning weight was improved only 0.19 lb. per year.

Improving Lamb Growth Genetically

Among the most economically important characteristics of lambs are their weights at weaning age and their growth rates after weaning. These determine the value of both slaughter and replacement lambs. We have found

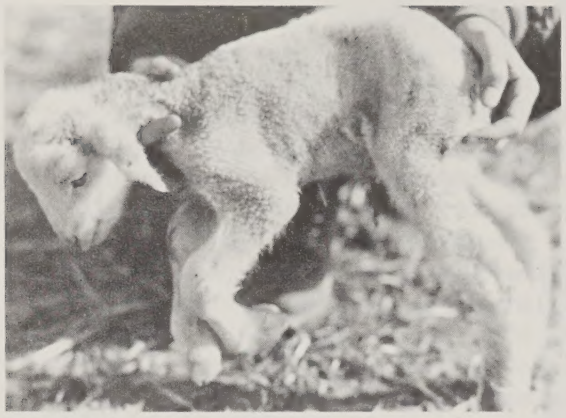
that if we account for the effects of all the important nongenetic factors mentioned above on weight and growth rate, that about 10 to 40% of the superiority of parents selected for weaning weight will be transmitted to their offspring. We found also that if we select lambs for post-weaning growth rate during a period when they are barely maintaining themselves on dry, sagebrush-grass type fall range, the genetic improvement we can expect will normally be less than half what we can expect if we select on the basis of more rapid gains made in a feedlot on 3.4 pounds of alfalfa pellets per day. In the former case only from 0 to 24% of the superiority of the selected parents, as compared to 38 to 66% in the latter case, will be transmitted to the offspring. This occurs because we can be more accurate (although still far from perfect) in our selection for genetic superiority under the latter circumstances. In other words, we can more than double our progress in improving growth rate by simply assuring that the animals are averaging at least ¼ lb. of gain per head daily when we observe the differences among them.

How Heritable are Weanling Traits?

To obtain the most efficient results in genetically improving one's flock, one should know, for a given set of circumstances, where selection pressure will do the most good. That is, which are the traits most likely to be improved (genetically) by selection. We have learned that, in general, the relative improvement to be expected in selecting for color on legs, weaning weight, neck folds, mutton conformation, fatness, uniformity of wool grade, proper occlusion of incisors and dental pad, average daily gain to weaning age (120 days), birth weight and index of overall merit is low to moderate ranging from 5 to 25% of that reached for in selecting the parents. In contrast, selection for improvement in horn score, face cover, staple length and fleece fineness is relatively more effective, with 40 to 80% of what one reaches for in the selected parents being transmitted to the offspring, particularly in the Rambouillet and Columbia breeds.

Importance of Birth Defects

The following questions often arise: "Just how frequent are birth defects? Is the frequency higher in inbred groups? Is it important to cull the parents of defective lambs?" To answer these questions we determined the incidence and distribution of birth defects over a 15-year period involving 52,422 births. The defects were categorized into 36 classes including classes for stillbirths and abortions. The total incidence of all classes of defects, except those relating to color or hair in the fleece, stillbirths and abortions, was 13.9 per 1000 births. The incidence of these same classes in closed inbred groups (about 25% inbred) was 19.1, and in closed groups where inbreeding was avoided (less than 7% inbred) it was 9.0. The incidence of fleece defects, mostly color defects, was 61.5 per 1000 in the inbred group and 39.4 per 1000 in the noninbred group. Stillbirths and abortions, which are the most important of all birth problems, occurred 51.6 and 34.6 times, respectively, in the inbreds and 39.7 and 29.4 times per 1000 births in the noninbreds. Considering all 36 classes of defects, the incidence was higher for the inbreds in 28 of the 36 classes. It would be easy to answer the third question in the affirmative if we knew



that each defect was highly heritable. The fact that the average incidence is higher in the inbred lines than in the noninbred groups indicates that heredity is involved in many of the defects, hence, culling the parents would reduce the incidence. Of course, culling the parents would be ineffective for those defects arising as accidents of development. A clear demonstration of the effectiveness of culling the parents of defective individuals, where the trait is known to be genetically controlled, may be seen in the incidence of black fleeces in the selected control groups, 0.35 per 1000 and in the nonselected control group where it is 1.74 per 1000 births. The lamb pictured on the above left exhibits a congenital arthritic condition of both front legs, which prevents him from straightening them. The condition appears to be the result of an accidentally abnormal fetal posture in the uterus.

Inbred vs. Noninbred Rams for Topcrossing

An important reason for the formation of inbred lines was to attempt to develop inbred rams with outstanding genetic characteristics which could be uniformly transmitted to the offspring when rams were topcrossed on outbred flocks. When inbreeding in the lines averaged approximately 25%, the sires were tested by topcrossing them on outbred ewes and comparing their progeny with those from sires developed without inbreeding. The results, based on weanling progeny, show that in Rambouillets only 7% of the inbred sires had topcross progeny superior to the noninbred sires in overall merit (an index of 6 traits) and none superior in weaning weight. In the Targhees 25% of the inbred sires were superior in overall merit and 65% were superior in weaning weight. In the Columbias, 70% of the inbred sires were superior in both overall merit and weaning weight. It is apparent that the results differ for each breed.

Breed Crosses Among Rambouillets, Targhees and Columbias

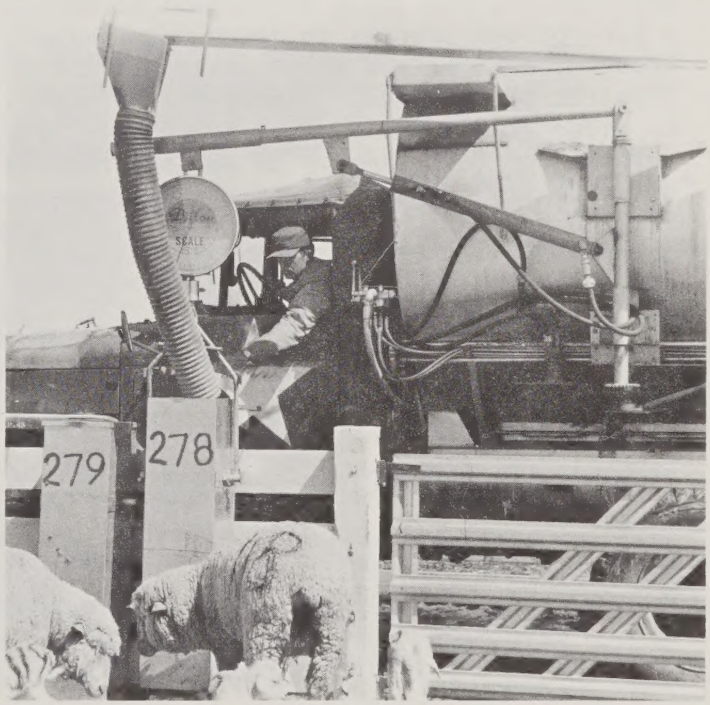
Because of their widespread importance as range breeds of sheep, it is desirable to know if the potential for exploiting hybrid vigor exists in crosses among the above breeds. Recent results show that Rambouillet (sire) times Targhee crosses and Rambouillet times Columbia crosses produced weanling offspring superior to straight Rambouillet matings by 5.3 and 6.4 index points in overall merit, 1.0 and 0.1 lb. in weaning weight, and 0.16 and 0.44 cm. in staple length. Targhee times Columbia crosses produced weanling offspring superior to the straight Targhee matings by only 0.31 cm. in staple length and 1.9 index points. Targhee times Rambouillet crosses produced offspring superior only for weaning weight (0.9 lb.). Columbia times Rambouillet crosses produced offspring superior to straight Columbia matings for weaning weight (5.5 lb.) and overall merit (2.0 index points). Columbia times Targhee matings were also superior for weaning weight (5.0 lb.) and overall merit (4.6 index points).

Lamb Carcass Investigations

At present we know very little about the genetic effects of selection for economically important live animal traits upon composition and quality of the carcass. Inasmuch as lean meat production is becoming increasingly important and because it is most difficult at present to select directly for improvement in carcass traits in sheep, it is essential to know how the carcass is affected by genetic changes in live animal traits. We have begun an intensive carcass study from which we have already verified that the live weight at slaughter is very nearly as useful as the whole carcass weight in predicting the weight of preferred cuts and leg and loin lean. Slaughter weight is among the most useful of all weight measurements for this purpose. We have learned also that percentage components of the carcass are much more difficult to predict accurately than weight components and that linear measurements of live animal or carcass components, excepting circumference of heart girth and of both legs, are much less useful than weight measures for predicting weight of preferred cuts and lean.

Current Research on Selection

In order for one to devise the most efficient and productive selection scheme possible for improving overall genetic merit, it is essential that one know how much of the superiority of selected parents, for each important trait, will be transmitted to their offspring. The amount transmitted will differ for each trait. Also, one must know to what extent and in what direction genetic change in a selected trait will cause genetic change in any other economically important trait. To obtain this essential information in the most accurate manner possible, we have recently begun a single trait selection program. We have chosen what we feel are among the currently most important and economically feasible traits to investigate. The primary traits for selection are rate of post-weaning gain, efficiency of post-weaning gain, weaning weight, efficiency of mature production, mature body weight, clean fleece weight and reproductive rate (through ovulation rate and number of lambs born). It is our objective to determine the direct genetic effects of selection on these traits and the resultant indirect genetic effects on other important economic traits such as pounds of lean meat production, staple length, wool quality and carcass quality. The picture at the right illustrates the method of weighing and filling individual feeders used for determining efficiency of post-weaning gain and mature production.



PHYSIOLOGY OF REPRODUCTION

Flushing and Breeding Time

Flushing in the fall at the U.S.S.E.S. has resulted in little if any increase in percent lamb production over the past three years but gives some response in midwinter (Sept., -3%; Nov., +9%; Jan., +26%). September breeding has resulted in more live lambs born than breeding in November or January (1.74, 1.63, 1.36 live lambs per ewe, respectively).

Three Lamb Crops in Two Years

Although a few Dorset and Rambouillet flock owners are having reasonable success breeding for three lamb crops in two years without hormones, many have not been successful. In many cases where natural methods are unsatisfactory hormone therapy using a carefully planned combination of hormones has proved successful. Our work indicates that ewes should be a minimum of 50 days postpartum at the time of rebreeding in the spring with hormones. Ewes should be fed heavily during lactation or the lambs early-weaned. At least one highly fertile active ram should be provided for each 10 to 15 hormone-treated ewes in breeding. A hormone breeding program should be attempted only after consultation with an experienced researcher in this field, otherwise results may be disappointing. The schedule and prescription must be followed exactingly.

Breeding Dry Ewes in the Spring

If ewes are dry two years in a row they should be culled. However, every sheepman always has an inventory of ewes each spring that are dry because of abortion, death of lambs at a young age, infertile rams, temporary illness, ewe lambs which fail to breed and other causes. This also is a part of our studies to develop an intensive lamb production system. A group of ewes of the above description were treated with a prescribed combination of hormones. Eighty-one percent lambed in the fall. This appears to offer good promise as an economical, practical method for rebreeding the dry ewe for fall lambs. If spring breeding is early enough (March, April or early May) most of these ewes, if they are in good condition, should rebreed naturally during the fall while nursing lambs. Rebreeding usually occurs about 30 to 80 days after lambing. They will rebreed a little earlier if the lambs are early weaned. Ewes should be on a high level of nutrition if being rebred during lactation.

Twice-a-year Lambing

This method is being investigated as a part of our overall objective at Dubois to develop an intensive lamb production system adaptive to range conditions. It has real potential for the sheep industry as it lends itself to relatively easy and efficient management patterns. The ewes can be lambed and bred in the spring and lambed and bred again in the fall. We are using a triple approach in an attempt to get a workable program. We are developing more effective hormone treatments, studying the effects of management practices such as level of feeding and condition of the ewe

and are selecting for response to the treatments. Presently we can get about 95% of the ewes to come in heat and ovulate about 35 days after lambing in the spring but only about 20% lamb in the fall on the average. What little evidence is available indicates that for some unknown reason the sperm are failing to fertilize the eggs. We are trying to determine the cause of this failure. Most of the ewes which lamb in the fall will rebreed naturally during late fall and lamb in the spring. We believe that by careful selection and improving our management and treatments an effective method will be developed. A possible indication of this is that six out of nine fall-born ewes which lambed in the spring at 18 months of age settled to hormone induced heat and lambed again in the fall when they were 24 months of age. This is over three times the percentage settling in the mature ewes.

Lambs born in the fall to lactating ewes bred in the spring

Finnish Landrace and Polled Dorset Rams Used in Intensive Lambing Studies

Rams of these two breeds are being used in crossing on Rambouillet and Targhee ewes to determine their usefulness in our twice-a-year lambing program. In addition to being highly prolific the Finnish Landrace have a short gestation (137 days) and may have a long breeding season. They also reach puberty at a very early age and normally lamb at one year of age. Dorsets have a relatively short gestation (143 days), a long breeding season, are relatively prolific and are known to be good milkers. Finnish Landrace will be crossed with the Rambouillet to form an F x R breeding group. The Dorsets will be crossed on Targhees to form a D x T breeding group. Some of the F x R will be crossed on some of the

Yearling Finnish Landrace Rams

D x T to form an F x R x D x T four way cross-bred group. All groups will be selected for production and response to intensive lambing techniques.

Finnish Landrace x Rambouillet crossbred ewe lambs at six months of age

Polled Dorset x Targhee crossbred ewe lambs at seven months of age

Breeding ewe Lambs

This offers a real potential for increasing lamb production and net profit and is also a part of our objective to develop an intensive lamb production system. It costs a certain amount to maintain ewe lambs their first winter. With three or four dollars in supplemental feed to continue rapid growth following weaning a high percentage will breed and produce lambs at 12 to 14 months of age even in range flocks. Of over 5,500 lambs not supplemented in the fall an average of only about 12% came in heat their first winter. However, when we supplemented our ewe lambs on dry fall range with an average of 1.75 lb. of alfalfa pellets 90% came in heat and 78% lambed. The Finnish Landrace x Rambouillet and Dorset x Targhee responded more favorably than the straight Rambouillet, Targhee and Columbia ewes. Hormone treatment in addition to the feed supplement increased still further the number of ewes coming in heat and lambing. The Finnish Landrace x Rambouillet ewes bred at a younger age than the other breeds (178 days vs. about 215 days of age). Last year 80% of our ewes which gave birth to live lambs at one year of age weaned lambs under range conditions. The lambs in our study were conditioned to eat alfalfa pellets in drylot before being turned to pasture. This may be important.

We got 0.25 lb. gain per day. Most lambs were 90 to 115 lb. at the time they were bred.

Pregnancy Testing Sheep

If desired ewe lambs may be pregnancy tested 30 to 90 days after breeding and the nonpregnant lambs sold. Thus, 95 to 100% of your save ewe lambs will lamb. This is the system being used in the beef cattle industry with heifers. There are two satisfactory pregnancy testing techniques available. Both require training and experience. The one we like best is the single finger palpation technique. A small area in front of the udder is shorn

Assembly line technique for rapid pregnancy palpation. Laparotomy restraining devices are shown in both the loading and operating positions.

and disinfected. A small incision just large enough to admit one finger is made. The uterus is palpated with a sterilized finger and pregnancy determined by the size and position of the uterus. A laparotomy restraining device which we have developed greatly speeds this technique. One experienced operator with assistants can examine 35 to 50 lambs or ewes per hour with an accuracy of 99 to 100%.

The other method is the Ultrasonic Doppler technique. The ewe should be 70 to 90 days postbreeding at the time of examination for greatest accuracy. The wool free area in front of the udder is moistened with a sponge. The Doppler transducer is then placed on this area and the area systematically searched for the pulse of the lamb placenta or heart. This rate is much more rapid than the pulse rate of the ewe. An experienced operator can examine about 20 to 30 ewes per hour with an accuracy of 95 to 97%.

ARTIFICIAL REARING OF LAMBS

The objective of this research is to find economical methods of artificial rearing of extra lambs that occur at lambing as a result of multiple births, twins from ewes of borderline milk production and lambs from ewes that die. Labor saving feeding systems and milk replacer formulas are being developed and evaluated. These investigations also include studies of weaning weights, weaning methods, post-weaning nutritive requirements, disease control and management of lambs reared artificially from birth to market weight.

Milk Feeding Period

Young lambs require a liquid milk diet until stomach development is sufficient to digest solid feeds. Newborn lambs must receive colostrum milk at first. When this cannot be obtained from the ewes, cow's colostrum obtained ahead of time and frozen, then thawed out at room temperature can be fed (4-6 ounces each 4-6 hours over first 18-24 hours). The use of freeze dried cow's colostrum milk is being studied.

Following the colostrum milk feeding the lambs can be self-fed a milk replacer formula. Earlier studies indicate that low-fat calf milk replacers containing high levels of dried whey are not entirely satisfactory for lambs. Current research includes studies of experimental milk replacer formulas for lambs. Until further research is conducted use of milk replacer formulas containing less than 30 percent fat is not recommended. Also, it is important that the milk replacer powder remain in solution after mixing with water.

In recent studies cold and warm milk replacer diets were compared in a self-feeding system. Overall lamb performance was more satisfactory on the cold milk diet. Lambs consume a small amount of the cold milk solution at each nursing, but nurse often. This reduces overeating and digestive problems. Also, keeping the milk cold prevents its souring in the feed container.

Milk replacer powder (30% fat) mixed at the rate of 2 or 2 1/2 lb. per gallon of warm water results in a solution similar to ewes milk in total fat and solids. Immediate cooling to 33 degrees F. tends to eliminate ingredient separation in storage and feed containers. In a free-choice feeding system, each lamb consumes 1/2 to 3/4 pounds of milk replacer powder in solution daily (2-4 pints of the liquid).

Consumption of solid food, in addition to the milk, aids in stomach development in the young lamb, which is essential when early weaning is accomplished. Thus, concentrate feed in pellet form, or coarse mix, and good quality alfalfa hay should be offered during the milk feeding period. Also, trace mineral salt and drinking water should be available, free choice.

To protect against overeating disease (enterotoxemia), newborn lambs are vaccinated with Clostridium perfingens, Types B, C & D, antitoxin again at six weeks to two months of age and with Clostridium perfingens, Type D, bacterin or toxoid.

Equipment

The type of equipment needed to prepare and feed milk replacer solution is determined by the number of lambs to be fed and the degree of automation desired. Automatic calf feeder machines that mix milk replacer powder with water and dispense resultant liquid to a feeding bucket or vat have been tested. These machines are designed to mix and dispense a warm milk solution. Difficulties were encountered with these machines using a 30% fat milk replacer powder mixed with cold water. Additional studies are being conducted on the use of automatic mixing and feeding systems.

For a small number of lambs the milk powder and water can be mixed with an egg beater or electric mixer. However, for a large number of lambs a conventional agitator type washing machine has proven satisfactory. A 24-hour supply of milk solution can be prepared once per day and refrigerated until needed.

Lam-Bar nipples and tubes attached to heavy plastic vats mounted in a plywood frame and installed in the lamb pens have been found to be a satisfactory feeding device. An allowance of three to five lambs per nipple seems satisfactory. The nipple should be about 14 inches above the floor, or ground level. Cold milk should be available in the vats at all times. In warm weather, plastic jugs filled with water and frozen to ice are placed in the feed vats to keep the milk temperature low.

To provide warmth for lambs in cold weather, infra-red (250-watt) heat lamps are mounted with reflectors about 24-30 inches above the floor (one lamp for each 12-14 lambs). Pens are bedded with straw or wood shavings. An allowance of seven or eight square feet of floor space per lamb has been found sufficient. To reduce incidence of coccidiosis, place all feeders and waterers so lambs cannot get their feet into them. Keep pens clean.

Post-Weaning Period

Weaning from milk can be accomplished when lambs reach 25-30 lb. body weight (30-45 days of age) and are consuming dry feed. Lambs weaned either abruptly or gradually from milk at this early age receive a slight growth check for about a week. It appears the post-weaning diet, until lambs reach about 60 lb., should be high in protein (15-20%) and energy, but low in roughage for maximum growth when confined to the drylot. Nutritive requirements of lambs through this weight range are currently being studied.

NUTRITION AND MANAGEMENT

Winter Feeding of Replacement Ewe Lambs

Winter feeding is one of the largest expense items for the sheepman. The most common feed for wintering sheep in the Intermountain area is alfalfa hay, usually baled. Station records indicate a 15% loss of baled hay in the stack from the time of purchase until it is fed. Quite often this hay is fed on the ground, resulting in considerable loss from selective feeding and trampling. This loss has been estimated at 30% of the hay fed. Because of the above circumstances and that 75% less labor is required to feed pellets, we have found pellet feeding to be more economical than feeding alfalfa hay.

Mechanized feeding reduces labor

We have found that replacement ewe lambs can be wintered more economically on pelleted chopped alfalfa than on alfalfa hay. In a 112-day trial, ewe lambs fed 4.5 lb. baled alfalfa hay per day on the ground gained an average of 20 lb., compared with lambs limit-fed 3.4 lb. alfalfa pellets, that gained 34 lb. Lambs self-fed alfalfa pellets consumed an average of 5.7 lb. per day and gained 61 lb. through the trial. The differences in body weight still were apparent after the summer grazing, but had disappeared by the time the ewes were three years old. At first shearing the self-fed and limited-fed sheep produced $1.02 and $0.52 more wool than the hay-fed sheep. By the time these ewes were six years old, their total lifetime production of lamb and wool was essentially the same for all feed levels. We now recommend feeding replacement ewe lambs 3.4 lb. of alfalfa pellets in the winter feedlot. These lambs will gain about 0.25 lb. per day and be in a thrifty, healthy condition. Our studies indicate this is about the optimum level of intake. Allowing ewe lambs much more than 3.4 lb. contributes to ewes that are too heavy and feed that is wasted. This recommendation does not contradict the positive relationship between body weight and pounds of lamb weaned. The most productive ewe is still the one with an inherent heavy body weight, not one which has been overfed to a heavy body weight.

Feed Levels for Ewes During Gestation and Lactation

Results of studies at this Station have shown that the National Research Council's recommended feeding levels for ewes in gestation and lactation may be higher than needed for economical production. These recommendations are that a 140 lb. ewe receive 3.4 lb. feed containing 1.7 lb. Total Digestible Nutrients (TDN) up to 6 weeks before lambing, 4.6 lb. feed with 2.4 lb. TDN from then until lambing, and 5.5 lb. feed with 3.1 lb. TDN after lambing. In these studies, ewes were wintered on 5.6 lb. baled alfalfa hay fed on the ground, or alfalfa pellets to supply 100, 95, 90 or 85% of the NRC recommendations. Ewes on the lower feed levels were lighter coming out of the winter

feedlot, but the greatest difference between treatments was only 6 lb. body weight. There were no differences in the weight of lambs born. Pounds of lamb weaned slightly favored the 95% level of feeding, but the 90 and 100% levels were equal. The wool clip on the 85% feed group was down an average of one lb. per ewe. It would seem that these ewes can safely be fed before lambing at 90% of the recommended levels without decreasing lamb or wool production. Consequently, we recommend feeding a 140 lb. ewe about 3.2 lb. of alfalfa pellets until six weeks before lambing, then up the feed to about 4.2 lb.

Ewes in breeding pens at winter feedlot

After lambing and before grazing starts, the ewes require high levels of feeding to maintain milk production. The ewes in the previous study were also used after lambing to compare baled alfalfa full-fed on the ground with alfalfa pellets self-fed or limit-fed. The limit-fed ewes received 6 lb. pellets per day, the recommended level. The ewes on self-feeders, with no limits on their consumption, consumed about 9 lb. of pellets per day. These ewes were 15 lb. heavier than the limit-fed ewes before going to the spring range and their lambs were 1 lb. heavier. However, by weaning time in mid-August the average body weight of the lambs from limit-fed or self-fed ewes was essentially the same. The heavier fleeces on the self-fed sheep did not justify, from an economic standpoint, the extra 3 lb. of feed. We do recommend that you have your feed analyzed to determine if it is deficient in minerals. We add 10% dicalcium phosphate to the salt.

Limit-feeding after lambing

Self-feeding after lambing

Early Weaning of Lambs

As an alternative management study, one breeding group of about 325 ewes is being used in an early-weaning study for five years. The lambs are weighed and scored the first week in July and the lambs from half of the ewes are weaned (average age 75 days). The weaned lambs are either put in the feedlot and self-fed a 3/8 barley - 5/8 alfalfa pellet, or put on irrigated pasture with the same feed in self-feeders. The other half of the lambs go to the summer range with their dams. All of these lambs are again weighed and scored at the normal weaning in August (average age 130 days). To date, the early-weaned lambs have gained as well as lambs sent to the summer range. Twin lambs weaned early may do even better than twins on the range. Lambs fed in drylot seem to gain as well as lambs self-fed on pasture. Dry ewes have maintained their weight on the dry range through the summer, and at up to 40 sheep-days per acre, apparently have not damaged the range. This management system can help the sheepmen whose summer range is in short supply, or alternatively allow him to expand his flock, as Forest Service regulations would allow him to run more dry ewes than ewes with lambs on his summer range allotment.

Grazing on Spring and Summer Ranges

The quality of forage on the spring and summer ranges is important to the growth of the lambs up to weaning. Digestion trials were conducted for several years on the sub-alpine summer range. For this work, yearling wethers with an opening (fistula) into the esophagus are used to collect samples of the forage eaten. The fistula is closed with a plastic cap when collections are not being made. Other wethers have canvas bags strapped on them to collect the excreta. By measuring the content of an indigestible plant material (lignin) in the forage samples and in the excreta, the amount of forage eaten and its digestibility can be calculated. On the summer range, these yearling wethers have averaged 3.0 to 3.4 lb. of forage dry matter intake per day, with 60 to 66 percent digestibility. The same technique was recently used on the sagebrush-bunchgrass spring range. Average intake of organic matter (mineral-free) ranged from 4.3 lb. in early May, to 2.8 lb. in mid-June, with digestibility declining from 80 to 65% during this time.

Along with using these esophageal-fistulated sheep to determine digestibility of the range forage, portions of the fistula samples are examined under a microscope to identify the various plants eaten by the sheep, and the relative frequency of each type of plant in the diet. This information is very helpful in managing the range for the most desirable and productive plants.

Range digestion trial

RANGE RESEARCH

Spring vs. Fall Grazing

From past research conducted here by the Intermountain Forest and Range Experiment Station we know that spring-grazing increases the yield of threetip sagebrush and decreases grasses and forbs and that fall-grazing decreases the yields of this sagebrush and increases grasses and forbs (Figure 1). Will fall grazing give the same results on other sagebrush species? A study that clipped threetip sagebrush and big sagebrush 80% showed that threetip sagebrush is harmed more by leaf removal in the fall than big sagebrush. But we know that sagebrush is utilized less than 30% in the fall by sheep; generally less than 10%. We feel that another factor, competition from healthy grasses and forbs caused by the spring rest and fall trampling by sheep, may be more important than the direct grazing of the sagebrush by sheep. So the answer is probably yes; fall grazing will decrease other sagebrush species, thereby improving the range.

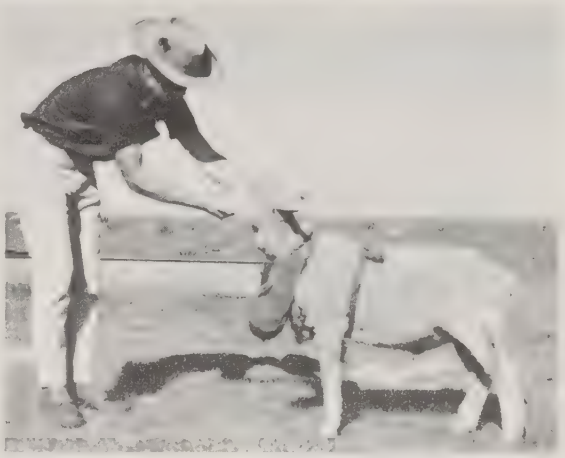
Summer Grazing of Sagebrush-Grass Range

Can sagebrush-grass range normally used for spring-fall grazing be utilized by sheep in the summer? Ewes that are early-weaned of their lambs can be maintained during the summer season (July 7 - Sept. 1), for at least one season. Average weights have ranged from +11 lb. gain to -17 lb. loss per sheep. The long term effect on sheep longevity and reproduction is under study now. Other results show that the vegetation in the summer will withstand heavier grazing than during the more critical spring period although a few of the grasses can still be damaged during the early summer. Later in the summer, after seed set, the benefits of fall grazing should occur.

Range Nutrition and Sheep Diet

Do sheep need good range? Presently, the effect of range condition in supplying the nutrient required by sheep is under study. Esophageal fistulated sheep collected vegetation samples from a good and poor condition range. The vegetation sample is examined to determine the plants eaten by sheep as well as the nutritive value to the sheep. From this and other studies we know that a mature ewe, on her own, can do fairly well on poor condition ranges. However, we feel that in two areas of sheep production a good condition range is better. First, a good range is better in supplying ewes and

lambs with the palatible grasses and forbs necessary to maintain lactation and growth. Second, a good range with the increased grasses and forbs should increase the numbers of sheep that can be grazed.



What do sheep eat? On high elevation summer range sheep ate less grasses and sedges as the season progressed. Two forbs, pale agoseris and mountain sorrel were highly preferred but because of their scarcity contributed little to the sheep's diet. Alpine aster and Montana knotweed were eaten more as the season progressed. The forb consumed the most by sheep on the summer range was Northwest cinquefoil, which was only slightly preferred but occurred often on the range. Sticky geranium, the most abundant species on the range, was eaten very little.

Sagebrush Burning

Can sagebrush burning improve the range for livestock? Yes, if certain conditions prevail.

1. Where fires can be and will be controlled.
2. Where principal use of the area is for livestock grazing.
3. Where soils are fairly firm and slopes less than 30%.
4. Where big and threetip sagebrush are dense and form more than a third of the plant cover.
5. Where fire-resistant perennial grasses and weeds form more than 20% of the plant cover; or if they form less than 20%, reseeding to perennial grasses is practicable.
6. Where proper grazing practices can be and will be used after burning.

WOOL RESEARCH

Core Test

Clean wool yield along with staple length are the most important quality traits for establishing value of grease wool. Clean fiber present can be determined scientifically by the core test. The amount of clean wool and current clean wool price quotation will establish a grease price representative of wool merit.

Scourable Branding Fluids

Generally legibility of brands decreased with scourability of fluids, however scourable fluids exhibited brands legible enough for practical use. Black color was superior to any other color. Finer wool tended to produce more legible brands than coarse wool. An increase in staple length was accompanied by a decrease in legible brands. Environment influences legibility of brands.

Wool Value

Wool with scourable branding fluids have brought three cents per grease pound more than comparable wool containing unscourable branding fluids. Fine staple wool (2½ inches and longer) has sold for nine cents per grease pound more than Fine French wool (under 2½ inches in length). Clean yield, uniform grading, staple length, removal of crutchings, tags and freedom from black fibers are some of the factors which will influence market value.

Uniformity of Diameter

Columbia fleeces at yearling age containing coarse hair-like and/or medullated fibers have been studied to determine change in quality that may occur from one fleece to the next as the sheep grew older. After four years the fleeces from these same ewes were coarser, heavier, and more variable than the average four year old Columbia ewe fleece. This type fleece would not meet quality wool standards of the Columbia breed.

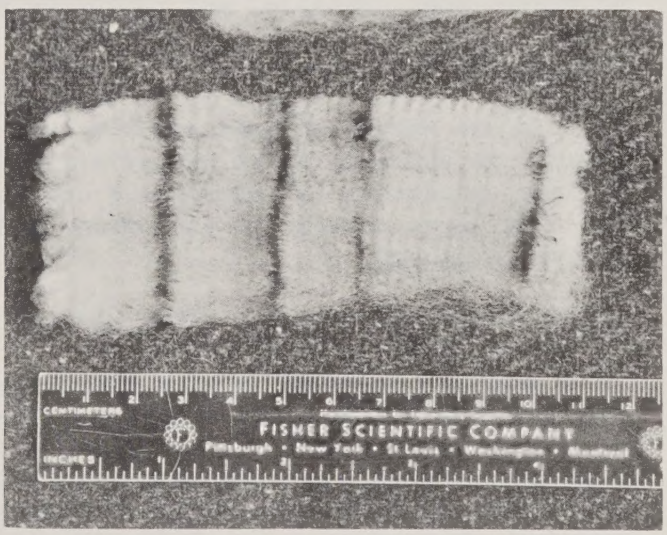
Lamb Birthcoat

Studies have shown that the amount of hair-like fibers and wool fibers in the birthcoat as determined by the scoring technique has little or no relationship to future body weight or to the quality or quantity of wool production.

Staple Length

Length, a physical property of the wool fiber is very significant from the standpoint of utility and value. Average staple length made up of all fibers within the staple is more practical to measure than fiber length. Total staple length is frequently measured by parting the wool at a designated area on the animal and measuring with a ruler in inches or centimeters from the skin surface to the tip.

Dye-stripe may be applied to fleeces to record seasonal pattern of wool growth, or to mark the occurrence of particular events such as mating, parturition, lactation and weaning. The wool grown in each period or between events delineated by the dye-stripe may be ascertained in terms of staple length growth. Retarded growth occurring during any specified period may be accelerated by change in management or nutrition.



ANIMAL DISEASE

Disease research is a cooperative effort with U.S.S.E.S. personnel and facilities and the Department of Veterinary Science at the University of Idaho, the Idaho State Sheep Commission and the Animal Health Division of the U. S. Department of Agriculture.

Bluebag of Ewes

Organisms isolated from active cases of bluebag here at the station were sent to a commercial firm and incorporated into a vaccine. Before lambing the 2-3-and 4-year-old ewes at this Station were bagged for udder lesions and conformation and these conditions were categorized under a scoring system and recorded. One half of these ewes were vaccinated with the vaccine, the remaining half were left unvaccinated as controls. The value of the vaccine has not yet been determined. Valuable information was obtained showing a high relationship between udder classification scores and pounds of lamb produced. Two-year-old ewes with minimum secretory tissue weaned 10 pounds less lamb than ewes the same age but with a sizeable milk cistern. We are repeating this study.

Vibriosis

The Veterinary Science Department of the University of Idaho and the Veterinary Research lab at Caldwell have worked on this problem in Cooperation with the U.S.S.E.S. for several years. From these efforts much valuable information about the methods of spread, control measures and treatment has been obtained.

Enterotoxemia or Overeating Disease of Lambs

A trial is now being conducted with an antibiotic feed supplement added to the milk replacer of lambs to determine the efficacy of this drug when added to feeds in reducing the incidence of enterotoxemia. All lambs lost at the station after 1 week of age are being autopsied to determine the cause of death, when possible, and to survey the actual loss due to enterotoxemia.

Coccidiosis

Trials have been conducted at this Station with the drug Amprol in an attempt to evaluate it as an efficient, safe and economical drug to be used by sheep producers in controlling coccidiosis in lambing shed operations. The drug shows promise if economical and practical methods of using the drug can be developed.

Ram Epididymitus Organism (REO) and its Control by Management

We have been working with the National Animal Disease Laboratory of USDA and the Idaho State Sheep Commission investigating the cause, transmission, prevention and control of this disease through management. Isolation of ram lambs from mature rams has reduced the incidence of this disease from about 4% to less than 1% by isolation management. The fertility of REO infected rams was comparable to non-infected rams if all rams had good semen quality. However, 38% of the REO infected rams were rejected for breeding because of poor semen compared to 5% rejection for rams not infected with REO.

NOTES